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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/636,028	08/06/2003	Cem Basceri	MI22-2233	1038
21567	7590	12/14/2006	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			CHAUDHRY, SAEED T	
			ART UNIT	PAPER NUMBER
			1746	
DATE MAILED: 12/14/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/636,028

**Applicant(s)**

BASCERI ET AL.

**Examiner**

Saeed T. Chaudhry

**Art Unit**

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____                                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date ____   | 6) <input type="checkbox"/> Other: ____                           |

Art Unit: 1746

## **DETAILED ACTION**

Applicant's amendments and remarks filed October 5, 2006 have been acknowledged by the examiner and entered. Claims 24-36 have been canceled and claims 1-23 are pending in this application for consideration.

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 148 USPQ 459, that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or unobviousness.

**Claims 1-4, 6-16, and 18-23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen et al in view of Cotte et al and Vaartsra.**

Chen et al (5,356,478) disclose a method for removing residues previously formed in a plasma chamber by dry etching layers such as photoresist, barriers, etc. It is conventional to dry etch a stack of thin layers which can include photoresist (for patterning the underlying layers), an anti-reflective coating, aluminum, and a barrier material. Such etching, however, results in residues or deposits building up on surfaces inside the plasma treatment chamber (see abstract and col. 1, lines 11-37). Chen et al fails to use supercritical fluid for cleaning the residue from the walls of the chamber.

Cotte et al (6,454,869) disclose a method of removing organic material from a surface of semiconductor manufacturing equipment. A semiconductor processing, handling and

Art Unit: 1746

manufacturing equipment 16 to be cleaned is introduced into a cleaning zone 14 of a processing chamber 12 wherein the equipment 16 is exposed to liquid carbon dioxide or supercritical carbon dioxide. To ensure that the liquid carbon dioxide and supercritical carbon dioxide remains in the liquid or supercritical state during processing, the processing chamber 12 is maintained at a pressure in the range of between about 1,000 psi and about 6,000 psi. The temperature within processing chamber 12 is maintained in a range of between about 40.degree. C. and about 100.degree. C. (see col. 2, lines 37-57).

Liquid or supercritical carbon dioxide is provided into processing chamber 12 by means of a liquid or supercritical carbon dioxide source 30 (see col. 2, lines 66-67). The semiconductor processing, handling and manufacturing equipment 16 to be cleaned in accordance with the present invention, as stated above, is introduced into sample zone 14 of the chamber 12 wherein it is exposed to liquid or supercritical carbon dioxide (see col. 3, lines 19-23).

As those skilled in the art are aware, coating of semiconductor wafers with photoresists is a critical processing step in the formation of semiconductor chips. Typically, a photoresist is cast upon semiconductor wafers while the wafers are rotated to provide a uniform coating thereupon. Such turntable assemblies are schematically represented at 44 in FIG. 4. Obviously, these assemblies are contacted with photoresist residue which falls off wafers during application. As such, they are ideal candidates for cleaning in accordance with the process of the present invention (see col. 3, lines 44-56).

A photoresist may be better processed when the liquid or supercritical carbon dioxide contacts the photoresist in the presence of a surfactant. Thus, in a preferred embodiment of the

Art Unit: 1746

present invention, the cleaning agent is a liquid or supercritical carbon dioxide composition which includes a surfactant (see col. 3, lines 60-65).

The composition employed in the process of the invention can, in addition to supercritical or liquid carbon dioxide and a surfactant, include a further component, a co-solvent (see col. 4, lines 58-60).

Vaartstra (6,242,165) disclose a method of removing material in the fabrication of structures includes providing a substrate assembly having an exposed organic material and removing at least a portion of the exposed organic material using a composition having at least one component in a supercritical state. The composition includes an oxidizer selected from the group of sulfur trioxide ( $\text{SO}_3$ ), sulfur dioxide ( $\text{SO}_2$ ), nitrous oxide ( $\text{N}_2\text{O}$ ), NO,  $\text{NO}_2$ , ozone ( $\text{O}_3$ ), hydrogen peroxide ( $\text{H}_2\text{O}_2$ ),  $\text{F}_2$ ,  $\text{Cl}_2$ ,  $\text{Br}_2$ , and oxygen ( $\text{O}_2$ ). For example, the exposed organic material may be selected from the group of resist material, photoresist residue, UV-hardened resist, X-ray hardened resist, carbon-fluorine containing polymers, plasma etch residues, and organic impurities from other processes. The at least one component in a supercritical state may be an oxidizer selected from the group of sulfur trioxide ( $\text{SO}_3$ ), sulfur dioxide ( $\text{SO}_2$ ), nitrous oxide ( $\text{N}_2\text{O}$ ), NO,  $\text{NO}_2$ , ozone ( $\text{O}_3$ ), hydrogen peroxide ( $\text{H}_2\text{O}_2$ ),  $\text{F}_2$ ,  $\text{Cl}_2$ ,  $\text{Br}_2$ , and oxygen ( $\text{O}_2$ ); preferably sulfur trioxide. Further, the composition may include a supercritical component in a supercritical state selected from the group of carbon dioxide ( $\text{CO}_2$ ), ammonia ( $\text{NH}_3$ ),  $\text{H}_2\text{O}$ , nitrous oxide ( $\text{N}_2\text{O}$ ), carbon monoxide ( $\text{CO}$ ), inert gases (e.g., nitrogen ( $\text{N}_2$ ), helium (He), neon (Ne), argon (Ar), krypton (Kr), and xenon (Xe)); preferably carbon dioxide. Further, organic material removal compositions for performing such methods are provided.

Art Unit: 1746

It would have been obvious at the time applicant invented the claimed process to incorporate the cited steps of introducing a supercritical fluid compositions as disclosed by Cotte et al and Vaartstra et al into the process of Chen et al for purpose of removing residue such as photoresist from the internal surfaces of the chamber. This is because Chen et al disclose that it is conventional to remove residue or build up on surfaces inside the plasma treatment chamber. Further, one of ordinary skill in the art would utilize supercritical fluid for effectively removing the residue such as photoresist from the inside of the chamber, since Cotte et al disclose that photoresist is effectively removed by contacting with liquid or supercritical carbon dioxide. Vaartstra et al discloses that supercritical fluid are known to remove the exposed organic material selected from the group of resist material, photoresist residue, UV-hardened resist, X-ray hardened resist, carbon-fluorine containing polymers, plasma etch residues, and organic impurities from other processes. Therefore, it would have been obvious to utilize supercritical fluids for cleaning processes chambers.

Further Cotte et al disclose to remove organic or inorganic residue from the surfaces with supercritical fluid such as carbon dioxide. Therefore, one of ordinary skill in the art would expect that the residues as claimed in claim 2 and residue from the trap or dispenser will be removed by the supercritical fluid such as disclosed by Vaartstra et al. Furthermore, processing chambers having inlets and outlets for agents and recovery vessels are known in the art. Therefore, one of ordinary skill in the art would expect to clean those chambers as well with these supercritical agents.

**Claim 5 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen et al in view of Cotte et al and Vaartstra et al as applied to claim 1 above, and further in view of Goffnett et al.**

Chen et al, Cotte et al and Vaartstra et al were discussed supra. However, the reference fails to disclose that the processing chamber is selected from the group of a CVD chamber.

Goffnett et al (5,108,512) disclose a method for removing inner surface of a CVD chamber with pellets of carbon dioxide (see claims).

It would have been obvious at the time applicant invented the claimed process to clean a CVD chamber with the process of Cotte et al because it is known in the art to clean a CVD chamber as disclosed by Goffnett et al and one would expect that supercritical fluid would remove the residue in the CVD chamber because Cotte et al disclose to remove organic and inorganic residues.

**Claims 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al in view of Cotte et al and Vaartstra et al as applied to claim 1 above, and further in view of Smith, Jr. et al.**

Chen et al and Cotte et al Vaartstra et al were discussed supra. However, the reference fails to treat the surface with solvent before the treatment with supercritical fluid.

Smith, Jr. et al (5,417,768) disclose to remove residue from a surface by treating with a primary solvent and then flushing the solvent from the vessel and supplying carbon dioxide at supercritical conditions (see col. 5, lines 49-51 and claims).

Art Unit: 1746

It would have been obvious at the time applicant invented the claimed process to pre-treat the surface with a solvent as disclosed by Smith, Jr. et al into the processes of Jackson et al or Cotte et al to enhance the cleaning effect.

Applicant's arguments with respect to claims 1-23 have been considered but are deemed to be moot in view of the new grounds of rejection.

Applicant's amendment necessitated the new grounds of rejection. Accordingly, THIS ACTION IS MADE FINAL. See M.P.E.P. § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. § 1.136(a).

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED STATUTORY PERIOD, THEN THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R. § 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS FROM THE DATE OF THIS FINAL ACTION.

*Any inquiry concerning this communication or earlier communications from the examiner should be directed to Saeed T. Chaudhry whose telephone number is (571) 272-1298. The examiner can normally be reached on Monday-Friday from 9:30 A.M. to 4:00 P.M.*

*If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Michael Barr, can be reached on (571)-272-1414. The fax phone number for non-final is (703)-872-9306.*

*When filing a FAX in Gp 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are for entry into the file of the application. This will expedite processing of your papers.*

*Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (571) 272-1700.*

**Saeed T. Chaudhry**  
Patent Examiner



**MICHAEL BARR**  
SUPERVISORY PATENT EXAMINER